

A new interstitial catfish of the genus *Listrura* from Southern Brazil (Siluriformes: Trichomycteridae: Glanapteryginae)

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Abstract.—A new species of the poorly known glanapterygine genus *Listrura* is described from the State of Paraná, Southern Brazil. *Listrura boticario*, new species, is distinguished from its congeners by the absence of a dorsal fin and the autapomorphic presence of two pectoral-fin rays, a unique trait within trichomycterids. The limited phylogenetically informative data currently available indicates that the new species is the sister group to *L. nematopteryx*. *Listrura boticario* apparently occurs in the same peculiar microhabitat typical for other species of *Listrura*.

Resumo.—Uma nova espécie do pouco conhecido gênero de Glanapteryginae *Listrura* é descrita do Estado do Paraná, sul do Brasil. *Listrura boticario*, nova espécie, distingue-se das outras espécies do gênero pela ausência de nadadeira dorsal e pela presença autapomórfica de dois raios na nadadeira peitoral, uma característica única entre Trichomycteridae. Embora poucos dados filogeneticamente informativos estejam disponíveis, a nova espécie parece ser o grupo-irmão de *L. nematopteryx*. *Listrura boticario* parece ocupar o mesmo tipo de micro-habitat peculiar que as outras espécies do gênero.

Trichomycterids of the subfamily Glanapteryginae include some of the most distinctive of all catfishes, and are among the most unusual elements of the neotropical freshwater fish fauna. The morphologically most highly specialized members of the group, belonging to the genera *Pygidianops* and *Typhlobelus*, are blind, unpigmented sand-dwellers remarkably reminiscent of the amphioxus in general body aspect (cf. Myers 1944). The less specialized species, discovered more recently (de Pinna 1988) and included in *Listrura*, are pigmented, eyed inhabitants of leaf litter in semi-temporary water bodies in the Atlantic forest region of Southeastern and Southern Brazil. Their unusual habitats were discussed in Nico & de Pinna (1996). All glanapterygines are small-sized, secretive, cryptic, and with an irregular pattern of populational distribution, traits that make them rare in museum collections. Expectedly, samples

of glanapterygines usually represent new taxa (e.g., Landim & Costa 2002), and current knowledge about the biodiversity of the subfamily is markedly incomplete.

The subfamily Glanapteryginae was first supported as monophyletic by Baskin (1973). That hypothesis was corroborated in subsequent studies, which also incorporated new characters and information on forms discovered in the interim (de Pinna 1988, 1989, 1998; Costa & Bockmann 1994). All evidence indicates that *Listrura*, with three (four, with the new form reported herein) species from Southern and Southeastern Brazil, is the sister group to the remainder of the Glanapteryginae, composed of Amazonian and Orinocan forms. Within the latter subgroup, *Glanapteryx* (2 species) is the sister group to *Pygidianops* (1 species) plus *Typhlobelus* (2 species).

In this paper we report on a distinctive new species of *Listrura* discovered in a pri-



Fig. 1. *Listrura boticario*, holotype, MZUSP 69573, 36.7 mm SL, lateral view.

vate forest preserve in State of Paraná, Southern Brazil. Although currently known from only a single specimen, its distinguishing characters leave little doubt that it represents a new taxon. Additional specimens are necessary for more detailed studies, but it is timely to formally describe the new species with the material at hand. This is the first occurrence of a representative of the genus and subfamily in the State of Paraná, and documenting the existence of the species is prerequisite for biodiversity inventories and conservation measures. Furthermore, having the species name formally available will undoubtedly stimulate search for additional specimens.

Materials and methods.—All measurements are straight-line, taken with digital calipers. Body depth and internarial width were taken according to de Pinna (1989), anal-fin base length included the rim of integument along its anterior edge, caudal-peduncle depth was measured at the vertical through midlength of caudal peduncle. Remaining measurements followed Tchernavin (1944), but with rostral part of the head called snout length herein. Abbreviations are: CAS (California Academy of Sciences, San Francisco); INPA (Instituto Nacional de Pesquisas da Amazônia, Manaus); MZUSP (Museu de Zoologia da Universidade de São Paulo, São Paulo); ex (number of specimens); C&S (material cleared and stained); SL (standard length); and HL (head length).

Comparative glanapterygine material examined.—*Glanapteryx anguilla*: CAS

56048 (holotype), MZUSP 36530 (21 ex, 2 C&S). *Glanapteryx niobium*: INPA 12421 (holotype). *Listrura nematopteryx*: MZUSP 36974 (holotype), MZUSP 36975 (12 paratypes), MZUSP uncat. (5 ex C&S). *Listrura camposi*: MZUSP 63440 (1 ex). *Listrura tetraradiata*: MZUSP 50164 (3 paratypes). *Pygidianops eigenmanni*: CAS 11121 (2 paratypes, 1 C&S). *Pygidianops* sp.: INPA 8080 (3 ex). *Typhlobelus ternetzi*: CAS 56201 (2 paratypes, 1 C&S). *Typhlobelus* sp.: INPA 12929 (10 ex, 2 C&S). Comparative material of other trichomycterids is listed in de Pinna (1992).

Listrura boticario, new species

Figs. 1 and 2

Holotype.—MZUSP 69573, 36.7 mm SL, Brazil, State of Paraná, Município de Guaraqueçaba, pool adjacent to Rio da Figueira (tributary of Rio Morato, itself tributary to Rio Guaraqueçaba, an isolated coastal basin that drains directly into the Baía das Laranjeiras), inside the nature preserve “Reserva Particular do Patrimônio Natural Salto Morato” (25°16’S, 48°12’W, UTM: 7.212.500–7.215.400), collected by W. B. Wosiacki & J. C. Mateus, 30 Jul 1994.

Diagnosis.—The two-rayed pectoral fin distinguishes the new species from all other trichomycterids, which can have either a single ray, or three or more. *Listrura boticario* is further distinguished from its congeners by the absence of the dorsal fin. Within glanapterygines, the combination of



Fig. 2. *Listrura boticario*, holotype MZUSP 69573, views of head. A—dorsal; B—ventral.

presence of an anal fin and absence of the dorsal fin occurs only in species of *Pygidianops* and *Typhlobelus*, which are readily distinguishable from *Listrura* by the lack of dark skin pigmentation, and the possession of very reduced or absent eyes and very short or absent pectoral fins. *Listrura boticario* can be further distinguished from species of *Glanapteryx* by the presence of an anal fin and rounded caudal-fin margin. The new species is similar to the other species included in *Listrura*, except *L. tetraradiata*, in having only two latero-sensory pores on the skull, a consequence of a synapomorphic reduction of the latero-sensory canal system, which extends anteriorly only as far as the pterotic in that genus. The absence of a dorsal fin is also seen in most glanapterygines, except the three congeners of *L. boticario*, and the absence of pelvic fins is likewise shared with all other members of the subfamily except some specimens of *Glanapteryx*.

Description.—Morphometric data are provided in Table 1. Overall form of body similar to that of *L. nematopteryx* (see de

Pinna 1988, fig. 1 and Fig. 1 of present paper). Body elongate, head wider than trunk in dorsal view. Body slightly compressed anteriorly, gradually becoming more so posteriorly. Caudal peduncle gently tapering posteriorly toward caudal fin. Dorsal and ventral profiles of body nearly straight. Dorsal and ventral profiles of caudal peduncle (including fold corresponding to procurrent rays) gently convex and continuous with caudal fin. Dorsal keel of caudal peduncle extending anteriorly as low, mid-dorsal, rayless, cutaneous fold to beyond vertical through anus (Fig. 1).

Head small (HL approximately 13% of SL), depressed, shallower than body, with dorsal surface flat (Fig. 2A). Branchial membranes narrowly united to isthmus, gill openings wide, not constricted. Eyes located dorsolaterally on head, very small but well formed, with distinct lenses and covered by thin transparent integument (Fig. 2A). Posterior naris oval (not round as in other species of *Listrura*), located midway between eye and anterior naris, and surrounded by low rim of integument, longer

Table 1.—Morphometric data for holotype of *Listrura boticario* MZUSP 69573 (in mm or as proportion of SL or HL, as indicated in parentheses).

standard length	(mm)	36.7
total length	(SL)	1.13
preanal length	(SL)	0.73
body depth	(SL)	0.11
caudal peduncle length	(SL)	0.22
caudal peduncle depth	(SL)	0.10
anal-fin base length	(SL)	0.06
head length	(mm)	4.8
head width	(HL)	0.85
head depth	(HL)	0.50
mouth width	(HL)	0.44
interorbital	(HL)	0.25
eye diameter	(HL)	0.06
snout length	(HL)	0.41
anterior internarial width	(HL)	0.23
posterior internarial width	(HL)	0.19
pectoral-fin length	(HL)	0.92
maxillary barbel length	(HL)	0.77
rectal barbel length	(HL)	0.61
nasal barbel length	(HL)	0.66

anteriorly. Anterior nares surrounded by tube of integument, continuous posterolaterally with nasal barbel. Opercular patch of odontodes small, with approximately six odontodes surrounded by fleshy rim of integument. Interopercular patch of odontodes rounded, twice as large as opercular patch, with approximately eight odontodes surrounded by rim of integument. Two conspicuous sensory pores, situated near dorsal margin of opercular patch of odontodes, representing anterior limit of cephalic latero-sensory system. Posterior pore located slightly anterior to vertical through base of pectoral fin. Mouth subterminal, with upper jaw slightly longer than lower and its corners slightly curved posteriorly in ventral view. Upper lip continuous with dorsal surface of head. Lower lip narrow and well differentiated, nearly straight, its width nearly constant along its entire extent (Fig. 2B). Snout with flat lateral expansion between eye and maxillary barbel base (Fig. 2). All barbels large and robust, similar to each other in general aspect and with visible internal cores. Extended maxillary barbel reaching base of pectoral fin. Rictal bar-

bel reaching posterior margin of interopercular patch of odontodes. Nasal barbel reaching posterior margin of opercular patch of odontodes. Lateral line nearly absent, represented by short oblique branch posterodorsal to base of pectoral fin, and detectable as two pores.

Pectoral fin long, narrow, originating immediately posterior to posterior margin of branchial membrane, and at vertical through posterior margin of opercular patch of odontodes (Fig. 2). Two segmented, unbranched pectoral-fin rays present. First ray approximately equal to HL, thicker and more than twice as long as second ray. Distal half of first ray coiled in holotype, probably as a postmortem effect, judging from similar situation often present in *L. nematopteryx*. Axillary gland small, apparently restricted to area posterodorsal to base of pectoral fin, with small pore located immediately dorsal to base of fin. Anal fin small, with six segmented unbranched rays (third and fourth longest) plus two small anterior unsegmented procurrent rays embedded in integument. Origin of anal fin adjacent to posterior margin of anus and continuous with integument surrounding vent. Dorsal and pelvic fins absent. Caudal fin large with round margin smoothly continuous with caudal peduncle. Caudal-fin rays 5+6 (middle two rays longest), with branched rays dividing once. Procurrent caudal-fin rays numerous, at least 30 dorsally and 28 ventrally. Exact number difficult to determine in alcoholic specimen. Five branchiostegal rays visible through overlying skin.

Pigmentation in preservative.—Dorsal one-third of trunk and all of caudal peduncle covered with round dark marks, more concentrated along their ventral limit on trunk (Fig. 1). A longitudinal series of tiny white dots along darkest part of trunk, superficially similar to pores of lateral line (which, as noted, is absent on the trunk of the species), probably representing neuromasts. Myomeres outlined by white lines on posterior one-third of trunk, gradually re-

placed by dark lines posteriorly on caudal peduncle. Dorsal surface of muscular base of pectoral fin with ring of dark pigment surrounding opening of axillary gland. Caudal fin with elongate dark fields on membranes of basal portions of principal rays. Region of procurrent caudal-fin rays with sparse dark fields dorsally but lacking dark pigment ventrally. Short dark band extending alongside base of anal fin. Anal and pectoral fins without dark pigment. Dorsal surface of head with irregular covering of semi-coalesced dark marks that do not form any definite pattern (Fig. 2A). Marks densest on snout and extending onto base of both opercular and interopercular patches of odontodes. Region of neurocranium darker than rest of head. Teardrop-shaped white area ventrolateral to each eye. Limit between head and trunk delineated by poorly-defined "M"-shaped white line. Rims of posterior nostrils and sensory pores white. Maxillary barbel with elongate scattering of dark chromatophores on its dorsal surface; ventral surface with sparse dark fields near base. Similar patterns of dark pigmentation on nasal and rictal barbels, but faintest on latter. Ventral side of head less darkly pigmented than dorsal, with irregular field of dark chromatophores over mental region; field of pigment curving posteriorly along bases of branchiostegal rays and then ventrally joining dark covering of interopercular patch of odontodes (Fig. 2B). Lower lip white, except for concentration of dark chromatophores medially.

Etymology.—The name honors the O Boticário Foundation, which owns and maintains the private nature preserve in Guaraqueçaba where the new species was found. A noun in apposition.

Habitat notes.—The single specimen of *Listrura boticario* was collected by hand-seining in a pool on a small island surrounded by the Rio da Figueira. The pool was isolated on the island but adjacent to the river, and presumably is confluent with the river during the peak of the rainy season. Standing water was only about 2–3 cm

deep, but it covered a thick layer of loose organic debris, into which collectors sunk nearly one meter at some sites. The whole area had a dense cover of emergent vegetation, and the surface of the leaf litter had thick deposits of loose, rust-colored bacterial growth. The habitat is similar to that described for *L. nematopteryx* by Nico & de Pinna (1996), except that there was no evident underground source for the water, although a slight surface current was noticeable. Several hours of additional collecting subsequent to the capture of the holotype failed to secure additional specimens of the species. Additional collecting in similar habitats around the type locality was also unsuccessful. Populations of the closely related *L. nematopteryx* apparently have a rather spotty distribution, with locally abundant populations concentrated in extremely restricted areas. If the new species follows this pattern, then it seems that the holotype was, at least on a small scale, a stray specimen.

Discussion.—Because a single specimen of *L. boticario* is currently available, its internal anatomy remains unknown. However, various details of its external morphology permit inferences about its phylogenetic relationships. The placement of the species in the subfamily Glanapteryginae is supported by three externally observable synapomorphies: 1) Pectoral-fin rays three or fewer; 2) Principal caudal-fin rays 5+6 or fewer; and 3) Latero-sensory system reduced on skull, and not entering the frontals (de Pinna 1988, 1998; see also Arratia & Huaquin 1995 for comparative schematic illustrations of the latero-sensory canal system in various trichomycterids). There is no known instance of a reversal of any of these characters. The last synapomorphy is inferred for *L. boticario* on the basis of the absence of any latero-sensory pores in the region of the head corresponding to the frontal bones. One of the few proposed synapomorphies for the genus *Listrura* is the more extreme reduction of the cephalic latero-sensory canals, which do not penetrate

the sphenotic but are restricted to the pterotic and supracleithrum. Again, the presence of this synapomorphy in *Listrura boticario* is inferred by the presence of only two pores in the temporal region of the head. This condition occurs in *L. nematopteryx* and *L. camposi* (in the latter, the condition was also inferred from the pattern of pores by de Pinna 1988). This character state is also present in *Typhlobelus*. Based on currently accepted concepts on glanapterygine relationships (Costa & Bockmann 1994; de Pinna 1988, 1989, 1998), the occurrence of this feature in both *Listrura* and *Typhlobelus* is convergent. Still, its value as evidence of relationships requires further investigation. The recently described *L. tetraradiata* has the latero-sensory canal system entering the sphenotic (Landim & Costa 2002), and has one additional anterior pore seen on the surface of the head. That is a plesiomorphic condition which may indicate that the species is the sister group to remaining species in the genus. Proper understanding of the phylogenetic significance of this character will require a quantitative phylogenetic analysis including all species in the subfamily.

De Pinna (1988) proposed that the bottle-shaped vomer in *L. nematopteryx* might be a synapomorphy for *Listrura*, pending confirmation of the character in other species of the genus. Landim & Costa (2002) observed the same derived condition in *L. tetraradiata*, thus providing further support for the interpretation advanced in de Pinna (1988). The condition of the vomer in *L. camposi* and *L. boticario* remains unknown because of the lack of study material.

Identification of the sister group of *L. boticario* within *Listrura* is difficult with the limited data available. The more extreme reduction of the pectoral-fin rays (4 in *L. tetraradiata*, 3 in *L. camposi*, 2 in *L. boticario*, and 1 in *L. nematopteryx*) may be indicative that *Listrura boticario* and *L. nematopteryx* are sister groups. This interpretation relies on the number of pectoral-fin rays being treated as a multistate character,

ordered according to a morphocline sequence. The state of four rays is closer to the plesiomorphic condition (all other trichomycterids and other loricarioids have five or more rays) and therefore is the plesiomorphic end of the series, with two and one rays considered to be successively derived states. This character has a homoplastic distribution in other glanapterygine genera, as discussed by Landim & Costa (2002). It is interesting to notice, however, that the state closest to the plesiomorphic condition (four rays) is seen in *L. tetraradiata*. The same species is also the only *Listrura* with a plesiomorphic laterosensory canal in the sphenotic (see above). This corroborates the hypothesis that *L. tetraradiata* is the sister group to all other *Listrura*.

The absence of a dorsal fin also seems to have a homoplastic distribution within glanapterygines. In addition to *L. boticario*, a dorsal fin is also absent in all species of *Glanapteryx*, *Pygidianops*, and *Typhlobelus*, which are hypothesized to form a monophyletic group (Baskin 1973; de Pinna 1988, 1989, 1998). The presence of a dorsal fin in the two other species of *Listrura* indicates that the fin has been convergently lost in *L. boticario*, a hypothesis that explains the distribution of the character with two steps. The alternative interpretation, that the loss of fin is homologous in all taxa, would require three steps (the loss at the base of the subfamily, with three subsequent reacquisitions in *L. tetraradiata*, *L. camposi* and *L. nematopteryx*). Those numbers rely on the assumption discussed above that *L. tetraradiata* and *L. camposi* are two successive sister groups to their congeners. In any event, inferences about the evolution of specific characters in the group are at present highly speculative. The phylogeny of species of *Listrura* is poorly understood, and current knowledge of their diversity is as incomplete as that of other glanapterygines. This situation makes any inferences based on character optimization premature.

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